ENGINEERING MAINTENANCE BRANCH BULLETIN

Issue # 008 **December 2005**

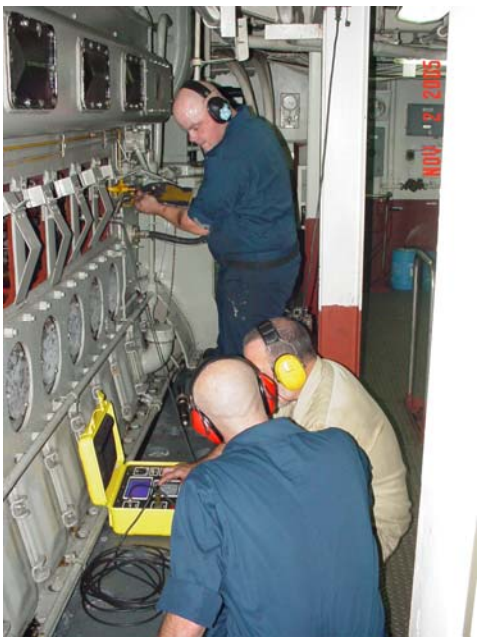
THIS MONTH'S BULLETIN CONTAINS:

This is the monthly bulletin to MSC ships and shoreside personnel. The purpose of the bulletin is to inform all concerned of current COMSC Preventive Maintenance management practices associated with any new or revised policy and procedures, along with helpful tips & tricks for improved maintenance. The bulletin will also discuss and present any upcoming initiatives in the various programs.

We continue our efforts to bring you useful information with the page dedicated to the Vibration Monitoring System (VMS). This will have useful tips as well as past case histories.

PICTURE OF THE MONTH - WE NEED YOUR PICTURES!!

It is said, **"A picture's worth a thousand words!"** Let's prove it right. If you have pictures of Shipboard Maintenance (Vibration Monitoring, Oil Sampling, machinery upkeep, etc.) being performed, or a visit from a SAMM or VMS Tech Rep, please send them (along with a *brief* narrative as to what the picture is) to Norm Wolf (e-mail: Norman.wolf@navy.mil).



Shown above is Dan Norton of Seaworthy Systems Inc. instructing USS CARTER HALL (LSD-51) MPA Eric Akins on the use of the Doctor Diesel Engine Analyzer.

SAMM/Maintenance Tips

Logbook Calculation Error – A Call for Help: Upon entering data into Logbook, you notice an error when the program tries to perform calculations. What to do? You can put a help call in to the MSC Global Helpdesk (E-mail: mscghd@msc.navy.mil). They will assign the call to Emprise Corp and the Engineering Maint. Branch (Code N711) will track it through to completion. This allows for trending & tracking, to develop improvements to the system.

-Tip provided by MSC Eng. Maint. Management Branch

Following Overhaul Of Equipment Complete All The Maintenance

If you have just had a major overhaul on a piece of equipment, complete all the maintenance with the exception of condition monitoring actions. This can be accomplished in Planned Maintenance by selecting the equipment, selecting the action to be completed, and then under the Action menu select Complete. Repeat this for all the maintenance actions. It is a great idea to add a comment in the 'Complete' screen when doing this, which comment will then show up in Machinery History that you completed the actions as a result of an overhaul.

-Tip provided by Seaworthy Systems Inc.

PROACTIVE MAINTENANCE:

(by Randel Torfin, N711 Branch Chief)

The basic mission of Preventive Maintenance (PM) is to ensure "that the physical assets continue to do what the operators want them to do". The old adage of "Don't fix it if it ain't Broke" needs to be extended to "If It Ain't Broke, Make it Better". This is fundamental to Proactive Maintenance.

MSC Engineering in conjunction with Program Managers is well along in a process of PM Optimization (PMO, see EM Bulletin #3) to review each ship's maintenance plan. The ability to apply different levels of maintenance effort to different equipment based on its overall importance or criticality to the functioning of a ship is one of the cornerstones of the PMO process. But, once the review of the PM is done, does MSC fall back into its old ways of a stagnant, reactive maintenance process or move to a Proactive Maintenance process?

There are four types of maintenance that organizations use to varying degrees:

- Reactive Maintenance, which is characterized by practices such as run to failure, breakdown, and emergency maintenance.
- Preventive Maintenance, which is typically time based, or periodic maintenance for overhauls, inspections, bearing lubrication, etc.
- Predictive or Condition Based Maintenance, which is typically vibration analysis, lube oil analysis, ultrasound analysis, Thermography, etc.
- Proactive Maintenance which looks to solve the root cause of machinery failures or extend the life of machinery through proactive practices such as precision alignment, precision balancing, improved specifications and better operating practices.

Proactive maintenance practices focus on the relentless pursuit of equipment condition assessment to ensure the reliability of a machine. Reactive maintenance practices focus on the quick response to machinery failures rather on focusing on the extension of machinery life through proactive, preventive and predictive maintenance activities.

To most people, maintenance is seen as a cost or a necessary evil that needs to be managed to minimize costs. Proactive organizations see maintenance as an investment in the future. By religiously pursuing machinery condition assessment through the maintenance process, they achieve lower costs by reducing reactive maintenance and emergency repairs. Reactive maintenance can be defined as work you didn't plan to do on a Monday morning, but had to do before the next Monday morning. Reactive maintenance tends to be almost twice the cost of "planned" corrective maintenance and should be kept to below 10% of the total cost of performing maintenance. Predictive, preventive and planned corrective maintenance should each be about 30% of the total maintenance cost for a ship.

You are probably wondering what this has to do with PM Optimization and the SAMM program. The purpose of maintenance is to keep an asset in an existing state and preserve it from failure or decline, not just to react to a failure and quickly repair the machine or asset. In order to have a completely effective maintenance program, we cannot allow the preventive and predictive maintenance programs to fall back to a static or stagnant state. In order to make the maintenance effective, machinery or asset failure information needs to be collected and analyzed to determine why the machine failed. By taking a proactive maintenance approach and analyzing failures, recommendations for changes to machine design, preventive/predictive maintenance or operational practices can be made to eliminate or reduce the number of machinery failures. Only through a process of continuous improvement will MSC achieve an effective maintenance program and reduce costs.

Maintenance management is an information-driven process and not a just repair process. MSC has all the pieces for proactive maintenance but they are not tightly integrated. The corrective maintenance process and data are currently not tightly integrated with the preventive and predictive maintenance processes. Without complete corrective and emergency repair data, meaningful changes to the SAMM preventive and predictive maintenance cannot be done. Review of machinery design cannot be done without complete machinery failure data. Determining the root cause of failures allows MSC to review the preventive/predictive maintenance, machine design and operation to mitigate future failures and reduce overall costs.

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Question of the Month: SAMM Inspection Maintenance Actions

(From Randel Torfin, N711 Branch Chief)

Why have an inspection PM like: "Inspect Pump Operation"?

I have been asked at times why SAMM has a maintenance action like "Inspect Pump Operation" when the watch checks the pump every watch. Rather than have a daily or weekly frequency the action has been extended because the failure mode of the machine and the rule of 6 to 1 indicate that a six-month or yearly inspection interval as a minimum is sufficient. To require the documentation of an inspection either weekly or daily would be burdensome. Also, the ABS PM program does not require that the documentation to be done daily or weekly. But, the machinery inspections need to be documented for historical purposes and ABS open and inspect accountability.

For more information, or if you have any questions/comments, contact Randy Torfin (randel.torfin@navy.mil).

Engineering Maintenance Branch Website – something old is new again!!

The Engineering Maintenance Branch web page has had a bit of a facelift; along with some helpful downloads (SAMM, PENG, EASy overviews, OAS Guide, past issues of our bulletin, etc.), the latest CMEO Class information and who to contact for questions or comments regarding Engineering. Maintenance. For helpful updates, keep checking it out!

http://www.msc.navy.mil/n7/engmgmt/engmgmt.htm

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Machinery failures need to be collected to allow the continuous review of PM/PdM to determine the effectiveness of inspection actions and the frequency they are performed. There is a rule of thumb termed the rule of 6 to 1. If an inspection action is performed six times and no corrective maintenance or emergency repairs are done based on the inspection, the frequency of the PM/PdM needs to be extended. The maintenance action is being performed too frequently.

In industry, plants where the reactive maintenance costs are over 58% of the total maintenance costs have 66% higher maintenance costs as compared to plants where the reactive maintenance costs are less than 15% of the total maintenance costs. The plants with less than 15% reactive maintenance have a mix of preventive, planned corrective, predictive and proactive for the balance of maintenance costs in some varying degrees.

HAPPY HOLIDAYS AND A SAFE NEW YEAR

From your Engineering Maintenance Management Branch (Code N711)

ENGINEERING MAINTENANCE BRANCH BULLETIN

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CMEO Training – What Are YOU Waiting For????

CMEO (**C**ivilian **M**arine **E**ngineering **O**fficer) is a two-week training course (held *quarterly*) at the Naval Supply Corps School in Athens, GA. It is for both shipboard and shoreside engineers. The Engineering Directorate (Code N7) of Military Sealift Command hosts the course and encourages ***ALL*** MSC Engineers (3rd A/Es through Chief Engineers, as well as Port Engineers and Project Engineers) to attend *(**Note:** MSC shipboard engineers are given priority when classes are full).*

CMEO provides training on an array of topics such as: SAMM (MALIN, Logbook, etc.), Vibration Monitoring, Lube Oil, Fuel Oil (NEURS), Chemicals (boiler treatment, sewage treatment, etc.), Supply (COSAL, ShipCLIP), Environmental, and Safety. SAMM is interactively taught using actual data and each module is discussed extensively.

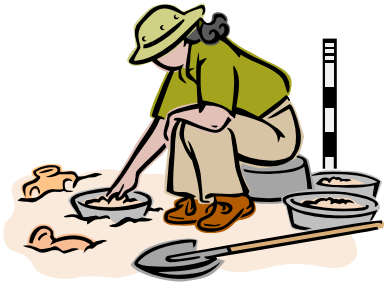
Upcoming CY '06 class dates:

- Jan 23-Feb 3, 2006
- April 17-28, 2006
- July 10-21, 2006
- December 04-15, 2006

For further information and to sign up, please go to the CMEO website:

http://63.219.124.12/cmeoclasssignup/cmeo.htm

Or contact Dave Greer (david.greer1@navy.mil) with any questions.



Help us help you! Dig out your Feedback!

We've had more and more requests for the newsletters, from both shoreside AND shipboard engineers, so we know you're reading them. Now, tell us what you think! Feedback is *ESSENTIAL* to making this a helpful bulletin to all shipboard personnel in doing your job "smarter not harder". Please pass on ***any and all*** feedback from your Engine Department.

Not just Junk mail

JUNK MAIL: You don't want it; we don't want to create it. Make this ***YOUR*** Maintenance Management Bulletin. If there's a SAMM or Maintenance tip, topic, question, suggestion, or comment on how to make this useful, or something relating to Engineering Maintenance you think should get out to the ships, please pass it on. Send your submission to Randy Torfin (randel.torfin@navy.mil) *OR* Norm Wolf (norman.wolf@navy.mil).

COMING UP FOR *NEXT MONTH*!

New SAMM/Maintenance Tips!

Precision Alignments: To Perform or Not to Perform? The Impacts.

Another Question of the Month

New Pictures of the Month!

Vibration Monitoring Tips & Information

Accelerometer Overload - Symptoms, Causes & Fixes

(By DLI Engineering)

A common diagnosis issued by the Expert System is "Accelerometer Overload", accompanied by a significant "Ski Slope" seen in the vibration plot. A "Ski Slope" is an elevated noise floor that decreases with increasing frequency. It often overwhelms any discrete, machine-related peaks at the lower frequencies. Whenever the system indicates accelerometer overload, manual data review is usually required to determine the cause of the bad data.

TRUE ACCELEROMETER OVERLOAD

True accelerometer overload is caused by exceeding the vibration limit of the accelerometer (typically 40 g's or greater), which saturates the internal amplifier. When this occurs, the electrical response of the accelerometer becomes distorted or temporarily unstable. The high amplitude vibration that causes this problem is usually high frequency, and possibly excites the natural frequency of either the accelerometer or the sensor mount. Unfortunately, such high amplitude, high frequency vibration is difficult to detect, and may be present even though a machine seems like it is running fairly smooth.

OVERLOAD DUE TO ELECTRICAL FAULTS

Accelerometer overload may also be caused by intermittent electrical faults, such as broken wires or loose connections. If the power supply to the sensor is temporarily interrupted, then the signal strength will fluctuate over a brief settling period. If this occurs while a vibration measurement is taking place, a ski slope may occur in the spectral data.

For the cluster-type sensors used on aircraft carriers, which are not ground-isolated, a ski slope may be seen on all channels when the ground connection (brown wire) to the accelerometer block is broken. This would not apply to the cluster-type sensors used for the MSC program, which are ground isolated. When a faulty cable or connector is suspected, the vibration sensor unit should be sent to DLI for replacement.

OVERLOAD DUE TO TEMPERATURE GRADIENT

Temperature gradients, such as might occur when a cold accelerometer is attached to a hot machine, can also cause a ski slope in the vibration spectra. Of course, this can be avoided by ensuring that temperature equilibrium is reached between the machine and the sensor before beginning testing.

OVERLOAD DUE TO OUTSIDE SOURCES

Random or non-periodic vibration that is within the measurement limit of the transducer will also result in a ski slope. This type of vibration is usually caused by some source outside the machine, or by the operating conditions changing during the measurement period. A loosely mounted sensor may also produce this problem. Always ensure that the machine remains in a steady-state condition while vibration data are being taken, and that external sources of strong vibration, such as diesel engines are at a minimum.

Bad cables, faulty connections, and improper sensor mounting should be eliminated as a cause of the ski slope before investigating true accelerometer overload. Cable problems should always be suspected when a ski slope is seen in data from multiple machines collected with the same transducer/data collector – especially if the overload always shows up on the same sensor channel. Be aware that the vibration plot designations "radial", "axial", and "tangential" depend only on the mounting pad orientation, and are not always associated with the same channel of the sensor.

It is not uncommon that one test location on a particular machine consistently indicates an accelerometer overload. When this occurs, the bronze attachment disk should first be replaced. If overload continues to be indicated, it could mean that some component of the machine's vibration (usually high frequency) is exceeding the range limit of the sensor. Such vibration might simply be inherent to the machine, and not necessarily indicate a problem. However, if previous measurements from the same test location did not result in a ski slope, and both hardware problems and external vibration sources have been eliminated as possible causes, then the accelerometer overload may indicate a presence of a developing mechanical fault. For example, the deterioration of ceramic bearings can generate significant high frequency vibration and cause overload.

Machine test locations that consistently produce accelerometer overload, but for which no other problem can be diagnosed, might require that measurements be taken with a different type of sensor, or that the data be analyzed with a technique other than spectral analysis. It is important to realize that vibration measurements are generally invalid if physical or electrical sensor overload occurs. Accurate machine condition information can rarely be deduced from such data.